

Fig. 1: Using digitalisation vehicle workshops can be made more efficient.

# Digital Management Systems in Maintenance

Benefits of digital asset management systems for reliable operation and for the optimisation of fleet availability and use of workshop capacities

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n order to ensure a reliable and at the same time economical transport operation, vehicles must be available at all times and they need to meet all safety requirements. The service life of vehicles and vehicle components is to be maximised and reliability and availability is to be increased. Conventional practice of maintenance reaches its limits: Today, modern traction vehicles are so complex that only few employees have many years of practical experience and know the special features of a vehicle down to the last detail.

Modern maintenance must therefore be able to optimally support employees regarding information on condition, providing maintenance recommendations and forecasts. In the age of the digital workshop, the analysis of existing information from measurement and operating data and maintenance information therefore plays an increasingly important role. The aim is to provide all the information, analyses and forecasts of each vehicle type which are required for making



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Photo: ZEDAS GmbH

a decision on an optimal maintenance strategy.

## Merging existing data and evaluating them comprehensively

Support for complex maintenance

zedas®asset. As an analytical information system, the software is able to collect and analyse data and thus "bring it to life": Operating data, master data, corrective and preventive maintenance data are centrally evaluated and continuously updated. Measurement and operating data are

of a digital asset management system like

Fig. 2: Malfunctions,

condition information

maintenance and

are recorded by

employees



Fig. 3: The forecast of wheelset wear shows when limit values are exceeded.

loaded into the system via interfaces; maintenance and condition information are recorded by the employees. Mobile apps, which offer online and offline functionality, enable consistent digital recording for workshop employees and the mobile service team. Interfaces also close the gap to external maintenance service providers.

Storing data centrally offers the possibility to relate all information to each other in order to provide the user with targeted, upto-date information, e. g. on the fleet status, current malfunction behaviour, necessary maintenance and possible breakdowns. The system provides the opportunity for extensive evaluations - from weak-point analyses of the individual vehicle components to the entire fleet, from the current vehicle status to a forecast status, from the individual work package to the entire workshop activity. The aim is to provide optimum transparency throughout the entire maintenance process and support in the planning and implementation of the growing maintenance requirements.

## Predictive maintenance, a result of intelligent data management

Wheelsets of rail vehicles are subject to high safety standards. Therefore, they have to be checked and measured regularly. Normally this is done cyclically or depending on the mileage. Fixed limits are defined and corresponding maintenance cycles are planned. The wear and tear of wheelsets is not linear and is furthermore dependent on a number of other factors such as environmental conditions, driving behaviour, gradients, weather and season, the rail and track profile. The frequency of reprofiling also has an enormous influence on the service life of the wheelsets. Therefore, the end of the service life can only be determined at a very late stage often only on short notice before expiry.

With a digital asset management system, measurement data of the wheelsets are imported via interfaces such as underfloor lathes, track scales or mobile measuring devices. By intelligently combining maintenance information, measurement data and load data, zedas®asset uses this information to derive condition forecasts and maintenance recommendations. In this way, it is possible to define the time for the next reprofiling and the prognosis for the end of the wheelset's life at an early stage.

Predictive maintenance also means being able to predict malfunctions of individual vehicle components, such as door contacts, and thus to optimally plan their timely replacement in the workshop work process. For this purpose, information from the vehicle control system is transferred and evaluated or collected in an on-board unit via specially installed sensors. This enables early warning of impending component faults.

### Optimised maintenance cycles with minimised repair work

A reliable prognosis of the course of wear and the probability of faults in vehicle components as well as the extrapolation of due dates for time and load-dependent maintenance make it possible to schedule workshop capacities in a targeted manner and to avoid bottlenecks in the workshop. Using the Resource Manager offers the chance to better plan required equipment and specialised staff. Conflicts arising from unforeseen repairs can be indicated and resolved.

Failures due to malfunctions are thus minimised and the workshop workload is reduced.

Better planning of workshop contents enables a targeted use of resources and optimised spare parts management.

The early recognition of requirements by the system means that the following can be achieved at an early stage: Creation of order proposals, prevention of the necessity of excessive minimum stock levels and ordering components in good time while observing delivery times. "Waiting for spare parts" and thus an delayed completion of work is reduced.

#### Sophisticated dashboards helping to keep the overview

The integrated dashboard function allows user and workplace-specific real-time evaluations to be provided. Information on the status of the vehicle being processed, the processing status of relevant work packages and next planned activities can be called up and displayed at the site-related respective workstation or on the workshop track.

Due to the exact time feedback of completed activities and the required performance times,



Fig. 4: Data analysis enables sound forecasts

individual employees but also administration are provided with a transparent presentation at any time. Delays in processing are recognised immediately and measures can be derived.

#### Investment planning in transport companies

By analysing the existing data, extended applications for planning demand and investments far into the future are also possible for fleet management. For this purpose, the system-related maintenance history, with information on the vehicle's life cycle, offers a cost-saving solution for corrective maintenance and predicted costs for preventive maintenance.

The investment manager analyses these data and links them to flexible parameters such as price increases, the influence of age and the strain on maintenance costs and determines a basic cost scenario for the investment project. This basic cost scenario can be adapted by the planner, using freely selectable factors and parameters. This results in several planning scenarios, which serve as a basis for decisions and can be compared one with another. Α comprehensive, graphic dashboard helps to evaluate the results.

#### Conclusion: Big Data becomes Smart Data

As shown in the example of the wheelset wear forecast, all data relating to vehicles, vehicle components, maintenance work carried out and data recorded via interfaces is archived in the system and is available for further analysis. Condition analyses and forecasts are practically a "waste product". Permanent automated evaluations and analyses provide up-to-date information.

zedas®asset allows you to view individual details of the vehicle as well as the entire fleet or the entire maintenance process. Detailed statements on the life cycle history file and condition prognosis of individual components are just as much in focus as comprehensive statements on the financing requirements for the entire vehicle fleet in the next ten years.

The software offers the user documenttation of previous maintenance measures and operational data as well as a constant overview of the current and future availability of his vehicle fleet and capacitities of his workshop. The digital analysis of all data also highlights critical conditions on the basis of a standardised error catalogue. Analyses of serial defects and weaknesses, RAMS and LCC key figures are available. The system provides on-time information about expiring warranty and guarantee claims.

#### Summary

#### Digital management systems in maintenance

Digital asset management systems can significantly optimise the maintenance process: They enable a higher vehicle availability and an even use of capacities of the workshops. Rail vehicle operators can thus obtain precise predictions of future failures, especially of wear parts. Asset management systems centrally combine all data in the maintenance process and evaluate them continuously in all directions. Consequently, the user always keeps an eye on the current status of his vehicles. On the basis of the data, predictive maintenance (e.g. in wheelset processing) is possible, which avoids unnecessary service appointments and unplanned downtimes. The systems create the appropriate duty rosters and order spare parts on time via the digitally integrated warehouse management system.